Prevalence rates of the common non-communicable diseases and their risk factors in Lusaka district, Zambia
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PREFACE

This report presents findings of a cross sectional study conducted in 2008 in Lusaka district, Zambia, to determine prevalence rates of the common non-communicable diseases and their risk factors. The Ministry of Health [Zambia] and the Word Health Organization (WHO) through the Country Office [Zambia] provided the funding.

Quality health information is essential for planning and implementing health policy in all countries. Risk factor data are especially important as predictors of future disease or injury. The World Health Report 2002: Reducing risks, promoting healthy life, identifies five important risk factors for non-communicable disease in the top ten leading risks to health. These are raised blood pressure, raised cholesterol, tobacco use, alcohol consumption, and overweight. The disease burden caused by these leading risk factors is global. In every region of the world, including the poorest, raised blood pressure, cholesterol, and tobacco use are causing serious disease and untimely deaths.

Country-level data is rare for many of these major non-communicable disease (NCD) risk factors. When data is available, it is not always complete or comparable, especially if it is based on self-reported health assessments or behaviour. A consistent approach to collecting and analyzing NCD risk factor data is needed to promote the usefulness of this data both for country health policy development and also for comparisons across countries and regions. WHO is promoting the use of the STEPwise approach to enable countries to set up surveillance systems for NCD risk factors.

STEPs is a sequential process of gathering comparable and sustainable NCD risk factor information at the country-level. By using the same standardized questions and protocols, all countries can develop surveillance systems containing quality information about NCD risk factors in their unique settings. This information can, in turn, be used to plan for and implement currently available interventions to address the disease patterns caused by these risk factors.

The STEPS approach is based on the concept that NCD surveillance systems need to be simple, focusing on a minimum number of risk factors that predict disease - before placing too much emphasis on costly disease registers which are difficult to sustain in the long-term.

STEPS is now being planned or implemented in 33 countries in WHO's South-East Asian Region, Western Pacific Region, African Region and Eastern Mediterranean Region. WHO/HQ is offering technical support in order to ensure quality control and enhance the comparability of data collection. Some 40 countries including Zambia are in the process of STEPS implementation.

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EXECUTIVE SUMMARY

Background

Developing countries are undergoing an epidemiological transition, from Communicable or Infectious to 'Non-Communicable' diseases. (http://www.prb.org/Articles/2006 /ChronicDiseases BeleaguerDevelopingCountries.aspx>p=1), such that cardiovascular disease, chronic respiratory diseases, cancer, and diabetes were responsible for 60% of all deaths globally in 2005, with more than 75% of these deaths occurring in developing countries (World Health Organization, 2005a). Unhealthy diet, physical inactivity, tobacco and alcohol use are important preventable major risk factors for chronic diseases that are related to lifestyle choices (http://www.prb.org/Articles/2006/Chronic DiseasesBeleaguer DevelopingCountries.aspx>p=1). The basis for prevention is the identification of these risk factors which underlie most chronic non-communicable diseases. The leading risk factor globally is raised blood pressure, followed by tobacco use, raised total cholesterol, and low fruit and vegetable consumption (World Health Organization, 2005b). Although limited Global School-Based Student Health Surveys and Global Youth Tobacco Survey enquiring on the lifestyles of adolescents had been conducted in Zambia (http://www.who.int/chp/gshs/Zambia%20fs%202004.pdf; Siziya, Rudatsikira & Muula, 2007a; Siziya, Rudatsikira, Muula & Ntata, 2007b; Muula & Siziya, 2007; Siziya, Muula, Kazembe & Rudatsikira, 2008; Muula, Kazembe, Rudatsikira & Siziya, 2007), no similar studies or more comprehensive studies had been conducted among the older age groups.

Objectives:

The aim of the survey was to determine the prevalence of common Non-Communicable Diseases (NCDs) and their associated risk factors in Zambia. Specifically the study was designed to determine the prevalence rates of the common NCDs and the extent to which behavioural and biological factors are associated with NCDs among Zambians.

Methodology

A cross sectional study utilizing a modified WHO STEPwise approach to surveillance of NCDs was conducted in Lusaka district, Zambia. Altogether 1928 individuals of ages 25 years or more participated in the study. Sex was not recorded on six of these participants, leaving us with 634 males and 1288 females. Multi-stage cluster sampling technique was used to select study participants. Finally all eligible members of a household that was selected were requested to participate in the study.

Information was gathered using a structured interview schedule. Data that was collected included socio-demographic factors, tobacco use, alcohol consumption, low intake of fruit and vegetable, physical inactivity, raised blood pressure, raised fasting blood glucose, obesity, and high levels of fat in the blood. Measurements of height, weight, waist, and blood pressure were taken, and blood tests for sugar and fats were conducted.

Data was double entered by two data entry clerks using Epi Data version 3.1. After data editing, analysis was done using SPSS version 14.0. Unadjusted odds ratios (OR) and their 95% confidence intervals (CI) are presented together with adjusted odds ratios (AOR) with their 95%CI obtained using Complex samples logistic regression having considered Standard Enumeration Areas as strata in order to determine independent predictors for selected risk factors for NCDs. Only significant factors at 5% level in bivariate analyses were considered in a multivariate analysis.

Results

A total of 1928 individuals participated in the survey, of which 33.0% were males. About half of the participants were of age 25-34 years (53.2%), and about a third of the respondents had attained secondary level of education (35.8%). The rate for current tobacco smoking was 6.8% (17.5% for males and 1.5% for females), current consumption of alcohol was 20.7% (37.9% of males and 12.2% of females), fruit was 23.6% and vegetable was 94.9% for most of the week, and physical activity was 31.4% (33.4% of males and 30.5% of females) for moderate-intensity recreational-related activities, and 15.1% (29.7% of males and 8.7% of females) for vigorous-intensity recreational

activities. Overweight or obese was estimated at 39.3% (20.6% of males, and 48.6% of females). The rate for moderate or severe hypertension was 12.5% (11.0% of males and 13.2% of females). The prevalence for impaired glucose level or diabetes was 4.0%, and that for raised cholesterol levels was 15.8%.

In multivariate analysis, factors associated with cigarette smoking were: sex, and body mass index (BMI). Female respondents were 90% (AOR=0.10, 95%CI [0.05, 0.23]) less likely to smoke cigarettes compared to male respondents. Compared to respondents who had <18.5 BMI, respondents who had higher BMI were less likely to smoke (AOR=0.30 (95%CI [0.15, 0.61]) for 18.5-24.9 BMI; AOR=0.12 (95%CI [0.05, 0.31]) for 25.0-29.9 BMI; and AOR=0.03 (95%CI [0.00, 0.26]) for 30+ BMI.

Sex was associated with alcohol consumption, with females being 68% (AOR=0.32, 95%CI [0.20, 0.51]) less likely to consume alcohol compared to male respondents.

Factors associated with sitting or reclining for at least three and half hours on a typical day were age, and work involving vigorous-intensity and moderate-intensity, Compared to respondents of age 25-34 years, respondents who were of age 45 years or more were 31% (AOR=0.69, 95%CI [0.55, 0.87]) less likely to have sedentary behaviour. Respondents who were not involved in moderate-intensity and vigorous-intensity activities at work were 32 % (AOR=0.68, 95%CI [0.55, 0.84]) and 48% (AOR=0.52, 95%CI [0.39, 0.69]) less likely, respectively, to have sedentary behaviour compared to respondents who were involved in such work-related activities.

Age, sex, cigarette smoking, and blood pressure were significantly associated with overweight or obese. Participants in the age groups 35-44 years and 45+ years were more likely to be overweight or obese (AOR=3.17 (95%CI [1.85, 5.44]) for age group 35-44 years; and AOR=2.37 (95%CI [1.32, 4.26]) for the age group 45+ years) compared to participants who were of age 25-34 years.. The female gender was positively associated with being overweight or obese (AOR=3.94, 95%CI [2.45, 6.33]). Non-smokers were 3.62 (95%CI [1.74, 7.54]) times more likely to be overweight or obese compared to

smokers. Compared to participants who had normal blood pressure, participants who had mild or moderate hypertension were more likely to be overweight or obese (AOR=1.74 (95%CI [1.05, 2.88]) for mild hypertension, and AOR=3.37 (95%CI [1.53, 7.39]) for moderate hypertension).

Factors associated with moderate or severe hypertension were: age, BMI, and cholesterol. Compared to respondents in the age group 25-34 years, older respondents were more likely to have moderate or severe hypertension (AOR=2.27 (95%CI [1.41, 3.67]) for 35-44 years age group, and AOR=8.66 (95%CI [5.75, 13.04]) for age group 45+ years). Compared to respondents with BMI of <18.5, those with BMI of 25+ were more likely to have moderate or severe hypertension (AOR=2.63 (95%CI [1.23, 5.63]) for 25.0-29.9 BMI, and AOR=4.16 (95%CI [1.91, 9.06]) for 30+ BMI). Participants with raised cholesterol levels were 63% (95%CI [1.11, 2.40]) more likely to have moderate or severe hypertension compared to participants with normal cholesterol levels.

Age and mild hypertension were significantly associated with impaired levels of glucose or diabetes. Compared to participants in the age group 25-34 years, older participants were more likely to have impaired glucose tolerance or diabetes (AOR=2.49 (95%CI [1.35, 2.92]) for 35-44 years age group, and AOR=3.80 (95%CI [2.00, 7.23]) for 45+ years age group). Mild hypertension was associated with impaired glucose tolerance or diabetes (AOR=2.57 (95%CI [1.44, 4.57]).

Factors associated with raised cholesterol levels were: age, and BMI. Older participants were less likely to have raised cholesterol levels compared to participants in the age group 25-34 years (AOR=0.44 (95%CI [0.31, 0.61]) for 35-44 years age group, and AOR=0.66 (95%CI [0.46, 0.95]) for 45+ years age group. Respondents who had BMI of 25 or more were more likely to have raised cholesterol levels compared to those who had BMI of less than 18.5 (AOR=3.38 (95%CI [1.68, 6.79] for 25.0-29.9 BMI, and AOR=2.92 (95%CI [1.38, 6.17]) for 30+ BMI).

Conclusions and recommendations

The tobacco smoking epidemic is in its early stage, as well as for diabetes. Hypertension, hypercholesterolemia, alcohol consumption, and overweight or obese are already at alarming levels. Although most people in the study setting consumed vegetables, the amount eaten was below the amount recommended by WHO. The frequency and amount of fruit consumption was also below the levels recommended by WHO. Only a small proportion of the respondents were involved in physical activity. Concerted effort to control tobacco use among adolescents when a significant proportion of adults initiate the habit guided by the WHO FCTC is needed. Health education interventions for people to adopt healthier lifestyles should be formulated taking into account the observed associations of the risk factors. This should include diet and physical activity in the programs.

ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
DPHR	Directorate of Public Health and Research
HIV	Human Immunodeficiency Virus
HSSP	Health Systems and Support Program
MoH	Ministry of Health
MSMH	Maina Soko Military Hospital
NCDs	Non-Communicable Diseases
SoM	School of Medicine
UNZA	University of Zambia
UTH	University Teaching Hospital
WHO	World Health Organization

CHAPTER 1
INTRODUCTION

"Non-communicable diseases (NCDs)" is a term used for chronic diseases that are non-infectious. They share common important features which include the following: They have their origin at young ages and epidemics take several years to become well recognized; NCDs to be treated, need long term systemic approach; and in view of their long duration, there are opportunities for prevention. Cardiovascular disease, chronic respiratory diseases, cancer, and diabetes were responsible for 60% of all deaths globally in 2005, with more than 75% of these deaths occurring in developing countries (World Health Organization, 2005a).

Some NCDs like cardiovascular diseases are increasingly affecting the working-age populations (ages 35 to 64 years) in low- and middle-income countries than in the United States and Portugal (Leeder et al, 2004). The control of NCDs has received little attention. For instance, the reduction of Non Communicable diseases is not a Millennium Development Goal (Horton, 2005). Many governments and organisations have focussed on controlling diseases like HIV/AIDS, malaria and Tuberculosis, and neglecting NCDs (Horton, 2005).

Current estimates indicate that Zambia may be one of the countries with a high prevalence of NCDs. For example, the number of people suffering from *Diabetes mellitus* in Zambia was estimated at 70,000 in 2000. This number is expected to increase to 186, 000 by 2030 (http://www.who.int/diabetes/facts/world_figures/en/index1.html). Hypertension was estimated around 608,034 from the same population (http://www.wrongdiagnosis.com/h/ hypertension/stats-country.htm). These are only estimates which may not represent the actual prevalence of hypertension and *Diabetes mellitus.*

In view of the fact that the main risk factors associated with NCDs like tobacco smoking, excessive alcohol intake, sedentary lifestyles, including poor diet, are modifiable through

changes in lifestyles, it is important that levels of these risk factors in the communities are identified and interventions put in place.

CHAPTER 2
LITERATURE REVIEW

The major NCDs which include cardiovascular diseases (CVD), cancer, chronic respiratory diseases and diabetes contribute immensely to mortality (World Health Organization, 2005a). All these diseases are associated with identifiable behavioural risk factors and biological risk factors. The two groups of risk factors are closely linked. The major behavioural risk factors are tobacco use, unhealthy diet and physical inactivity (http://www.prb.org/Articles/2006/ChronicDiseasesBeleaguerDevelopingCountries.aspx >p=1). And the major biological risk factors include; obesity, hypertension, diabetes and dyslipidemia (Yusuf et al, 2001). Most of these factors are modifiable through lifestyle interventions. Below we discuss associations of behavioural risk factors and biological risk factors on one hand and the NCDs on the other.

2.1 Tobacco smoking.

Worley (http://www.prb.org/Articles/2006/ChronicDiseasesBeleaguerDeveloping Countries.aspx>p=1) reports that the most important risk factors like unhealthy diet, tobacco use and physical inactivity, for chronic diseases are related to lifestyle choices. The author further reports that smoking is a risk factor for a number of chronic diseases, including CVD, cancer, and chronic respiratory conditions. In the Europe, the proportion of CVD deaths attributable to smoking in 35-69 years age group is 32% among men and 6% among women (http://rum.ctsu.ox.ac.uk/~tobacco/FINALAPP34.PD).

There is scarcity of information on smoking in Zambia. Recent findings from school health surveys suggest that as much as 27% of school going adolescents in Chongwe district of Zambia smoke (Siziya et al, 2007b). The earlier a person starts to smoke, the higher the chances of being a smoker in later life (Chen & Millar, 1998). There is evidence that smoking is increasing in low income countries. This is supported by data showing that the numbers of deaths due to smoking are as many in developing countries as in developed countries. For example 1.3 billion people world wide smoke and 84% of these are in developing and middle class countries (www.who.int).

2.2 Harmful alcohol use

Despite communities having the knowledge of the physical, psychological and social problems associated with abuse of alcohol, it is being used in most cultures (Naranjo et al, 1993). Apart from social consequences related to alcohol intoxication like impaired driving, aggression and violence towards others and self, unemployment, productivity losses, marital discord, alcohol consumption is also associated with chronic diseases (Naranjo et al, 1993; http://www.hc-sc.gc.ca/ahc-asc/activit/strateg/drugs-drogues).

The drinking of home brewed alcohol has been linked to oesophageal carcinoma in parts of Zambia. The association has been linked to contaminants like Zinc, Iron, Copper and Nitrosamine-like compounds which result from the use of old metal drum during production (Reilly, 1976). Home brewed alcohol which is unrecorded may account for a significant percent of total alcohol consumption in Zambia. One survey reported 29% of those surveyed indicated consuming illicit alcohol (Haworth & Simpson, 2004).

In another survey in Kitwe among miners, Buchanan showed that 30% of accident cases had measurable blood alcohol levels. Buchanan also reports that a third of randomly selected miners had measurable alcohol before starting work and 9% of these had levels above 17.8 mmol/l. He further reports that two thirds of a group of miners referred to hospital on suspicion of being under the influence of alcohol had blood alcohol levels exceeding 35.2 mmol/l. He concludes that the studies were significant enough to justify further studies (Buchanan, 1988). It would be important to find out if these findings still apply even today.

A recent report on the Zambia 2004 Global School-based Student Health Survey indicates that levels of drinking alcohol among 13-15 year-olds-school going adolescents are as high as 38.7% among males, and 45.1% among females (http://www.who.int/chp/gshs/Zambia%20fs%202004.pdf).

2.3 Physical inactivity and unhealthy diets.

Work and living situations have become more sedentary and diets have shifted to foods high in fats and sugars increasing the risk of NCDs (http://www.prb.org/Articles/2006/ ChronicDiseasesBeleaguerDevelopingCountries.aspx>p=1). Physical inactivity increases the risk of many chronic diseases, such as type 2 diabetes (Dunstan et al, 2007; Booth et al, 2002).

Data shows that there is an increase in obesity in developing countries with more than 30% of the populations in Latin America, the Caribbean, the Middle East and northern Africa being obese (Delpeuch & Maire, 1997). Metabolic syndrome which is a group of disorders that include obesity, insulin resistance, glucose intolerance, abnormal lipids and hypertension has been associated with reduced physical activities (Gao et al, 2007; Nelson & Gordon-Larsen, 2006).

Low physical activity like prolonged television viewing may contribute to metabolic syndrome through related poor eating habits (Dunstan et al, 2007). Several studies have showed an association between prolonged television viewing and metabolic syndrome (Dunstan et al, 2007; Gao et al, 2007). Metabolic syndrome has been linked to type 2 *Diabetes mellitus*, cardiovascular diseases and mortality and therefore reducing sedentary behaviour has a role in the prevention of these chronic diseases (Dunstan et al, 2007). Nelson and Gordon-Larsen (2006) observed that enhancing opportunities for increased exercises and sport may have a beneficial effect in leading risk behaviours.

In 2004, 33.1% of male and 32.7% of female school going adolescents of age 13-15 years in Zambia reported spending three or more hours during a typical day sitting and watching television, playing computer games, talking with friends, or doing other sitting activities (http://www.who.int/chp/gshs/Zambia%20fs%202004.pdf). No similar studies have been conducted among non-school going adolescents or among older age groups.

CHAPTER 3
STUDY JUSTIFICATION AND OBJECTIVES

The key to controlling the global NCDs epidemics is primary prevention based on comprehensive population-wide programmes. The aim is to avert these epidemics whenever possible and to control them as quickly as possible when they have already occurred. The basis for prevention is the identification of the major common risk factors and their prevention and control programmes. It is thus important to conduct surveys from time to time to assess the prevalence of behavioural and biological risks for NCDs. These data generated provide information on the magnitude of some of the NCDs and provide a platform for planning and implementation to prevention and treatment.

The general objective of the survey was to determine the prevalence of common NCDs and their associated risk factors in Zambia.

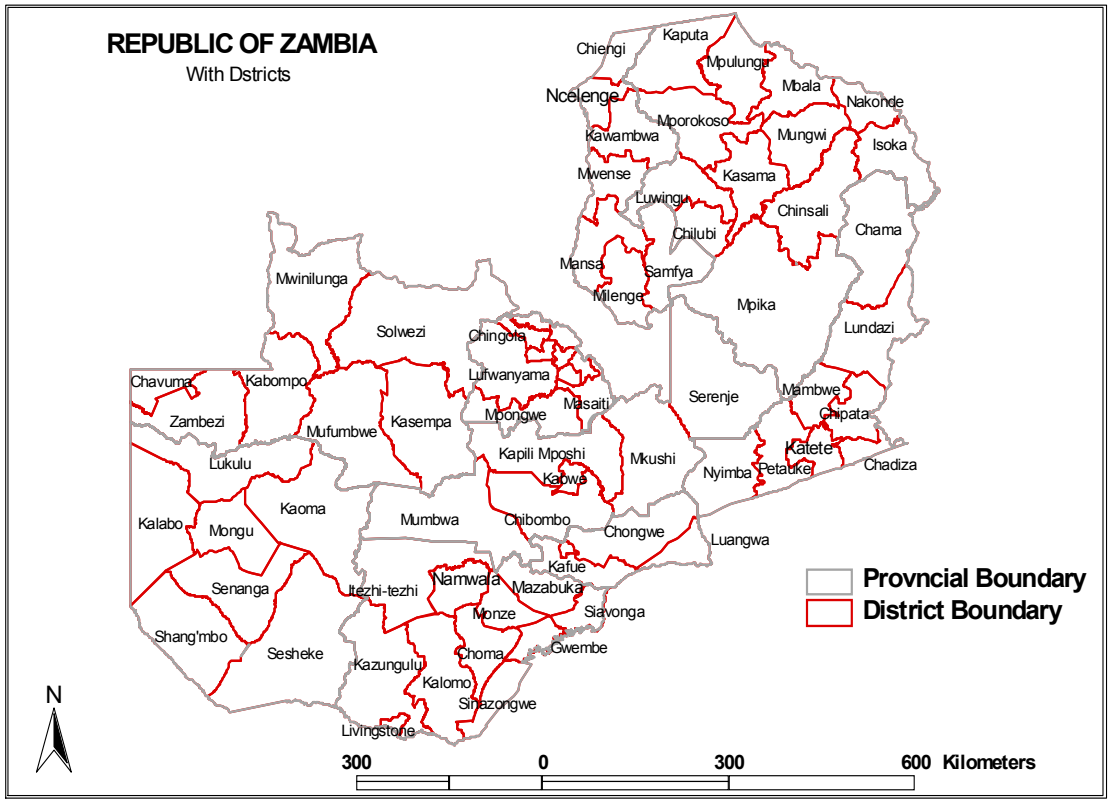
The specific objectives were: To determine the prevalence rates of the common NCDs, and to determine the extent of behavioural factors and biological factors associated with NCDs among Zambians.

CHAPTER 4
MATERIALS AND METHODS

4.1 Setting

The study was conducted in Lusaka district in low, medium and high density residential areas (Figure 4.1.1).

Figure 4.1.1: Map of Zambia showing the locations of the current study site and proposed districts that will be covered for the NCDs nationwide surveys.



Selected districts:

1. Lusaka	2. Kaoma	3. Lundazi	4. Mwinilunga
5. Kalomo	6. Serenje	7. Mansa	8. Kasama

4.2 Study Design

A cross sectional study utilising a modified WHO global surveillance initiative NCD-STEP 3 (World Health Organization, 2005b) was used in the proposed study.

4.3 Eligibility Criteria

Individuals (male or female) aged 25 years or older were eligible to participate in the study.

4.4 Sample Size Determination

The following formulae were used to determine the required sample size using the Statcal programme in Epi Info version 6.04:

$$\text{Sample size} = \frac{n}{1 + \frac{n}{\text{Population size}}}$$

$$\text{Where} \quad n = Z^2 \frac{P(1-P)}{e^2}$$

Using the information in the Table 4.4.1, the sample size needed was 383.

Table 4.4.1: Information required for computing the sample size

Total Population Size	1123753
Level of Confidence Measure	1.96 (at 95% Confidence level)
Margin of Error (e^2)	5%
Baseline levels of the indicators (P)	50% (as no estimates exist)
Number of provincial estimates	8 provinces
Design effect	2.00 (as no information on previous surveys is available)

Correcting for the loss of sampling efficiency due to the use of cluster sampling and considering the 8 provinces, we then have a sample size of 6128. Adjusting for 80% response rate, we get a sample size of 7660. By the end of a series of surveys to be conducted country-wide, we would have recruited 7660 participants from one urban and 7 rural districts in Zambia (Table 4.4.2). Considering that about a quarter (26%) (Central Statistical Office [Zambia], 2003) of the Zambians live in urban areas, 25% of the sample size was allocated to the Lusaka district, and the rest to rural districts proportional to population size.

Table 4.4.2: Sample size distribution by province/district.

Province	Location	District	Percent allocation	Sample size
Central	Rural	Serenje	9	690
Eastern	Rural	Lundazi	15	1149
Luapula	Rural	Mansa	11	843
Lusaka	Urban	Lusaka	25	1915
Northern	Rural	Kasama	11	843
North-Western	Rural	Mwinilunga	8	613
Southern	Rural	Kalomo	11	843
Western	Rural	Kaoma	10	766
TOTAL			100	7662

In Lusaka district we aimed to sample a total of 1915 participants, distributed per ward as shown in Table 4.4.3

Table 4.4.3: Sample size allocation per ward in Lusaka district.

Ward	Percent allocation proportional to population size	Sample size
Chakunkula	11	211
Kamwala	14	268
Mulungushi	4	77
Mwembeshi	46	881
Nkoloma	25	479
TOTAL	100	1916

4.5 Sampling

A multi-stage cluster sampling technique was used to select study participants.

First stage of sampling 1 urban and 7 rural provinces

We conveniently sampled Lusaka to represent urban provinces (Lusaka and Copperbelt). The rest of the provinces that were rural were included in the sample: Central, Eastern, Luapula, Northern, North-Western, Southern, and Western.

Second stage of sampling 1 urban and 7 rural districts

There were 9 urban and 63 rural districts in Zambia. A district was classified as urban if it had more urban than rural health centres, and conversely, it was classified as rural if it had more rural than urban health centres (Ministry of Health [Zambia], 2008).

Central province had 5 rural districts (Chibombo, Kapiri Mposhi, Mkushi, Mumbwa, and Serenje) and one urban district, Kabwe. With the exclusion of the urban district from the sampling frame, Serenje district was randomly selected from the remaining rural districts. Lundazi district was randomly selected from all 8 rural districts (Chadiza, Chama, Chipata, Katete, Lundazi, Mambwe, Nyimba, and Petauke) in Eastern province. In Luapula province, Mansa distict was randomly selected among 7 rural districts (Chiengi, Kawambwa, Mansa, Milenge, Mwense, Nchelenge, and Samfya). All the 12 districts in

Northern province were rural (Chilubi, Chinsali, Isoka, Kaputa, Kasama, Luwingu, Mbala, Mpika, Mporokoso, Mpulungu, Mungwi, and Nakonde), and Kasama was randomly selected form the list. All the 7 districts (Chavuma, Kabompo, Kasempa, Mufumbwe, Mwinilunga, Solwezi, and Zambezi) in North-Western province were rural, and Mwinilunga was randomly selected. Southern province had 1 urban district (Livingstone) and 10 rural districts (Choma, Gwembe, Itezhi tezhi, Kalomo, Kazungula, Mazabuka, Monze, Namwala, Siavonga, and Sinazongwe). Livinstone being an urban district was excluded from the sampling frame. Kalomo was randomly selected from the 10 rural districts. All the 7 districts in Western province were rural (Kalabo, Kaoma, Lukulu, Mongu, Senanga, Sesheke, and Shang'ombo), and Kaoma was randomly selected.

Sampling stages 3 to 6

We present here the 3rd to 6th stages of sampling that were done for the Lusaka survey only, and for the remaining districts, sampling procedures will be presented in later versions of the report when those districts will be surveyed.

Third stage of sampling constituencies

Lusaka district had 7 constituencies (Chawama, Kabwata, Kanyama, Lusaka Central, Matero, Munali, and Mandevu), out of which 5 (Chawama, Kabwata, Matero, Munali, and Mandevu) were randomly selected.

Fourth stage of sampling wards

From each selected constituency, one ward was selected. Mandevu constituency had 6 wards (Chaisa, Justine Kabwe, Mulungushi, Ngwerere, Raphael Chota, and Roma). Roma and Mulungushi wards were mainly low density areas, and Mulungushi was randomly selected to represent low density areas in Lusaka district. Chawama ward was randomly selected among other wards: Lilayi and Nkoloma in Chawama constituency. Kabwata constituency had Chilenje, Kabwata, Kamwala, and Libala wards; and Kamwala was randomly selected. In Matero constituency, Mwembeshi was randomly selected among other wards: Kapwepwe, Lima, Matero, and Muchinga. Finally, in

Munali constituency, Chakunkula was randomly selected among other wards: Chainda, Kalingalinga, Mtendere, and Munali.

Fifth stage of sampling Standard Enumeration Areas (SEAs)

The number of Standard Enumeration Areas (SEAs) selected in each ward was proportional to its population size. Six SEAs were selected using a 1 in 4 systematic random sampling method from 24 SEAs in Chakunkula ward. Nine out of 31 SEAs were selected from Kamwala wards using a 1 in 3 systematic random sampling method. From Mulungushi ward, 4 out of 15 SEAs were selected using a 1 in 4 systematic random sampling method. Mwembeshi had 45 SEAs, out of which 12 were selected using a 1 in 4 systematic random sampling method. In Nkoloma ward, 11 out of 42 SEAs were selected using a 1 in 4 systematic random sampling method.

Sixth stage of sampling households and eligible persons

Households were systematically sampled in order to widely cover the selected SEAs. All persons of ages 25 or more years were requested to participate in the survey.

4.6 Data collection

The WHO global surveillance initiative for NCD (World Health Organization, 2005b) has three steps: Step 1 is the questionnaire, Step 2 is physical examinations, and Step 3 is biochemical examinations. All these steps were conducted within the participant's house.

Two nurses, 2 technologists, 1 undergraduate student, 1 Diploma student, and 1 person with experience with the Central Statistical Office in surveys, and 1 person with little experience in surveys who later had intensive training worked initially in two groups and later in four groups. A driver was tasked to drive the interviewers around and carry field equipment.

Interviews

An interview schedule was used to elicit responses from the interviewees. The questionnaires was divided into the following sections: Demographic information,

Tobacco use, Alcohol consumption, Diet, Physical activity (physical activity at work, for transport, during leisure time, and sedentary behaviour), History of raised blood pressure, History of diabetes, biological measurements (Height and Weight, Waist, Blood pressure, Hip circumference and Heart rate) and biochemical measurements (Blood glucose, Blood lipids, and Triglycerides and HDL cholesterol).

Measurements

The WHO STEPs surveillance training and practical guide recommends that physical measurements be taken in the following order: height, weight, waist circumference, and blood pressure. We chose to take blood pressure readings first, after having administered the questionnaire. This gave the participant enough time to have settled down.

Blood pressure

The Omron Digital Automatic BP Monitor M4-1 was used to measure the blood pressure of the participants. Three minutes of rest was given to the participant in between three successive readings of blood pressure. Although the three readings were different with the largest value being the first reading and the smallest being the third reading on average, these differed by no more than 2 mm/Hg of systolic blood pressure, and no more than 4.5 mm/Hg of diastolic blood pressure. We chose to take an average of the three reading, and not the average of the second and third readings as recommended by World Health Organisation in order to increase the degrees of freedom for the mean.

Height

The Seca Brand 214 Portable Stadiometer was used to measure the height of the participant. Height was measured without the participant wearing foot or head gear. Before the reading was taken, the participant was requested to have feet together, heels against the back board, knees straight, and look straight ahead. Height was recorded in centimetres.

Weight

Weight was measured using the Heine Portable Professional Adult Scale 737. Participants were asked to stand still, face forward, and place arms on the sides of the body. Weight was recorded in kilograms.

Waist circumference

The Figure Finder Tape Measure was used to measure the waist circumference in centimetres. This measurement was taken in a private area. The midpoint between the inferior margin of the last rib and the crest of the ilium were marked using a tape measure. With the assistance of the participant, the tape measure was wrapped around the waist directly over the skin or light clothing. Just before the measurement was taken, the participant was requested to stand with their feet together, place their arms at their side of their body with the palms of their hands facing inwards, and breathe out gently.

Hip circumference

The measurement for hip circumference was taken in a private area immediately after the waist circumference. The Figure Finder tape Measure was used in measuring the hip circumference in centimetres. The measurement was taken at the maximum circumference over the buttocks, after requesting the participant to relax the arms at the sides.

Heart rate

The heart rate was recorded simultaneously while taking blood pressure readings using the ORMRON digital automatic blood pressure monitor M4-1.

Biochemical measurements

Fasting glucose and total cholesterol were determined using an Accutrend GCT Meter Three-in-One System (Glucose, Cholesterol and Triglycerides).

4.7 Data entry

Two data entry clerks were trained to enter the data using Epi Data version 3.1. Data was double entered and validated. The data entry template had consistency and range checks embedded in it. The data entry clerks were trained and supervised by the Principal Investigator. The validated data was exported to SPSS version 14.0 for analysis.

4.8 Data Analysis

The analysis included running frequencies, cross-tabulations, bivariate, and multivariate Backward logistic regression. Unadjusted odds ratios (OR) and their 95% confidence interval (CI), and adjusted odds ratios (AOR) and their 95%CI are presented.
Body mass Index (BMI) was categorized as <18.5 (lean), 18.5-24.9 (normal), 25.0-29.9 (over weight), and 30+ (obese); waist-hip ratios was grouped into two: $\leq$1 (normal) and >1 (raised); systolic blood pressure was grouped into four levels: <140 (normal), 140-169 (mild hypertension), 170-179 (moderate hypertension), and 180+ (severe hypertension); similarly diastolic blood pressure was grouped into four levels: <90 (normal), 90-99 (mild hypertension), 100-109 (moderate hypertension), and 110+ (severe hypertension). Glucose levels were grouped into hypoglycaemia, normal, impaired glucose tolerance, and diabetes; and cholesterol levels were either normal (<5.2 mmol/L) or otherwise raised.

4.9 Ethical considerations

The study protocol was reviewed by the University of Zambia (UNZA) Research Ethics Committee (REC), and the study only commenced when approval from the UNZA REC was granted. All entry forms were kept in the office of the Principal Investigator. Entry forms were only viewed by approved study personnel.

CHAPTER 5
RESULTS

5.1 Demographics

A total of 1928 individuals participated in the survey, of which 33.0% were males. About half of the participants were of age 25-34 years (53.2%), and a third of the respondents had attained secondary level of education (35.8%). About 1 in 5 of the respondents were either self employed (22.5%) or housewives (20.0%). Further description of the sample is presented in Table 5.1.1

Table 5.1.1: Demographic characteristics for the sampled population.

Factor	Total n (%)	Male n (%)	Female n (%)
Age group (years)			
25-34	1015 (53.2)	337 (53.7)	675 (52.9)
35-44	413 (21.6)	135 (21.5)	277 (21.7)
45+	481 (25.2)	156 (24.8)	323 (25.3)
Sex			
Male	634 (33.0)	-	-
Female	1288 (67.0)	-	-
Education			
None	408 (21.5)	76 (12.2)	330 (26.0)
Primary	276 (14.5)	61 (9.8)	214 (16.9)
Secondary	679 (35.8)	242 (38.8)	435 (34.3)
College/university	534 (28.1)	244 (39.2)	290 (22.9)
Main work status			
government employee	231 (12.0)	116 (18.5)	115 (9.1)
non-government employee	224 (11.6)	124 (19.8)	100 (7.9)
self employed	433 (22.5)	160 (25.6)	273 (21.5)
domestic worker	73 (3.8)	39 (6.2)	34 (2.7)
Student	65 (3.4)	31 (5.0)	34 (2.7)
house wife	385 (20.0)	-	383 (30.2)
Retired	81 (4.2)	52 (8.3)	29 (2.3)
unemployed (able to work)	234 (12.1)	84 (13.4)	148 (11.7)
unemployed (unable to work)	174 (9.0)	20 (3.2)	152 (12.0)

5.2 Tobacco use

Overall, 6.8% of the participants currently smoked cigarettes, and of these 77.6% smoked cigarettes daily. All together, 2.8% of the participants had ever smoked cigarettes. Among the participants who currently smoked tobacco daily, 36.5% of them started smoking daily when they were teenagers (10-19 years old). Current and ever used smokeless tobacco was estimated at 0.6% and 0.7%, respectively. There results are shown in table 5.2.1.

Table 5.2.1: Tobacco use

Factor	Total n (%)	Male n (%)	Female n (%)
Currently smoked cigarettes			
Yes	130 (6.8)	111 (17.5)	19 (1.5)
No	1795 (93.2)	522 (82.5)	1267 (98.5)
Currently smoked tobacco daily			
Yes	97 (77.6)	82 (75.9)	15
No	28 (22.4)	26 (24.1)	2
Ever smoked tobacco daily			
Yes	54 (2.8)	44 (7.2)	10 (0.8)
No	1847 (97.2)	569 (92.8)	1272 (99.2)
Age when first started smoking daily (years)			
10-19	35 (36.5)	31 (38.8)	4
20-29	37 (38.5)	32 (40.0)	5
30+	10 (10.4)	9 (11.3)	1
Do not remember	14 (14.6)	8 (10.0)	6
Currently used smokeless tobacco			
Yes	11 (0.6)	2 (0.3)	9 (0.7)
No	1892 (99.4)	611 (99.7)	1275 (99.3)
Ever used smokeless tobacco			
Yes	13 (0.7)	2 (0.3)	11 (0.9)
No	1889 (99.3)	611 (99.7)	1272 (99.1)

When determining factors associated with tobacco smoking, sex, body mass index (BMI), and current alcohol use were significantly associated with smoking in bivariate analyses (Table 6.2.2). However, only sex, and BMI were independently associated with smoking.

Female respondents were 90% (AOR=0.10, 95%CI [0.05, 0.23]) less likely to smoke cigarettes compared to male respondents. Compared to respondents who had <18.5 BMI, respondents who had higher BMI were less likely to smoke (AOR=0.30 (95%CI [0.15, 0.61]) for 18.5-24.9 BMI; AOR=0.12 (95%CI [0.05, 0.31]) for 25.0-29.9 BMI; and AOR=0.03 (95%CI [0.00, 0.26]) for 30+ BMI.

Table 5.2.2: Factors associated with tobacco smoking

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
Age (years)		
25-34	1	-
35-44	1.36 (0.88, 2.12)	
45+	1.20 (0.77, 1.85)	
Sex		
Male	1	1
Female	0.07 (0.04, 0.12)	0.10 (0.05, 0.23)
Completed level of education		
None	1	-
Primary	1.21 (0.69, 2.09)	
Secondary	0.92 (0.58, 1.47)	
College/university	0.62 (0.36, 1.06)	
Body Mass Index (BMI)		
<18.5	1	1
18.5-24.9	0.43 (0.27, 0.69)	0.30 (0.15, 0.61)
25.0-29.9	0.12 (0.06, 0.24)	0.12 (0.05, 0.31)
30+	0.05 (0.02, 0.18)	0.03 (0.00, 0.26)
Consumed alcohol in past 30 days		
Yes	1	1
No	0.39 (0.20, 0.76)	0.68 (0.32, 1.44)
Time usually spent sitting or reclining on a typical day		
<1.5	1	-
1.5-3.4	1.06 (0.68, 1.67)	
3.5+	0.98 (0.61, 1.58)	

5.3 Alcohol consumption

Table 5.3.1 shows rates of alcohol consumption. Altogether about 1 in 5 (26.3%) participants consumed alcohol during the 12 months prior to the survey, and of these participants 13.9% drank alcohol daily. About a third (35.2%) drank on average 3 or 4 standard drinks of any alcoholic drink during one day when they drank alcohol. Prevalence of current alcohol consumption in past 30 days was estimated at 20.7%. Most of the respondents consumed alcohol on Saturday (80.7%), followed by Friday (70.3%), Sunday (65.6%) and Monday (65.9%).

Table 5.3.1: Alcohol consumption

	Total	Male	Female
Factor	n (%)	n (%)	n (%)
Consumed alcohol in past 12 months			
Yes	505 (26.3)	276 (43.5)	227 (17.7)
No	1418 (73.7)	358 (56.5)	1056 (82.3)
Frequency of consuming alcohol in past 12 months			
Daily	69 (13.9)	52 (19.2)	17 (7.6)
5-6 days/week	12 (2.4)	8 (3.0)	4 (1.8)
1-4 days/week	135 (27.1)	92 (33.9)	43 (19.1)
1-3 days/month	170 (34.1)	85 (31.4)	83 (36.9)
less than once a month	112 (22.5)	34 (12.5)	78 (34.7)
Average number of drinks drank in a day			
1-2	96 (19.4)	30 (11.0)	66 (30.0)
3-4	174 (35.2)	91 (33.5)	82 (37.3)
5-6	120 (24.3)	73 (26.8)	46 (20.9)
7+	96 (19.4)	70 (25.7)	26 (11.8)
don't know	8 (1.6)	8 (2.9)	0 (0)
Consumed alcohol in past 30 days			
Yes	398 (20.7)	240 (37.9)	156 (12.2)
No	1525 (79.3)	394 (62.1)	1127 (87.8)
Consumed alcohol on day of the week:			
Monday	116 (65.9)	75 (70.8)	41 (58.6)
Yes	60 (34.1)	31 (29.2)	29 (41.4)
No			
Tuesday			
Yes	95 (58.6)	65 (64.4)	30 (49.2)
No	67 (41.4)	36 (35.6)	31 (50.8)

Wednesday			
Yes	105 (59.0)	67 (61.5)	37 (54.4)
No	73 (41.0)	42 (38.5)	31 (45.6)
Thursday			
Yes	91 (55.8)	59 (59.0)	32 (50.8)
No	72 (44.2)	41 (41.0)	31 (49.2)
Friday			
Yes	142 (70.3)	93 (73.8)	49 (64.5)
No	60 (29.7)	33 (26.2)	27 (35.5)
Saturday			
Yes	196 (80.7)	121 (82.9)	74 (77.1)
No	47 (19.3)	25 (17.1)	22 (22.9)
Sunday			
Yes	128 (65.6)	86 (70.5)	42 (57.5)
No	67 (34.4)	36 (29.5)	31 (42.5)

Among the factors considered to be associated with alcohol consumption in Table 5.3.2, the most important predictor for alcohol consumption was sex. Female respondents were 68% (AOR=0.32, 95%CI [0.20, 0.51]) less likely to consume alcohol compared to male respondents.

Table 5.3.2: Factors associated with alcohol consumption

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
Age (years)		
25-34	1	-
35-44	0.89 (0.53, 1.52)	
45+	1.02 (0.57, 1.81)	
Sex		
Male	1	1
Female	0.32 (0.20, 0.51)	0.32 (0.20, 0.51)
Completed level of education		
None	1	-
Primary	1.51 (0.69, 3.30)	
Secondary	1.74 (0.92, 3.30)	
College/university	1.67 (0.86, 3.23)	

Body Mass Index (BMI)		
<18.5	1	-
18.5-24.9	0.48 (0.16, 1.41)	
25.0-29.9	0.28 (0.09, 0.86)	
30+	0.37 (0.11, 1.24)	
Time usually spent sitting or reclining on a typical day		
<1.5	1	-
1.5-3.4	1.31 (0.74, 2.32)	
3.5+	1.02 (0.57, 1.82)	

5.4 Diet

Table 5.4.1 shows rates of consuming fruits and vegetables. While only 23.6% of the respondents ate fruits 5-7 days in a typical week, 94.8% ate vegetables 5-7 days in a week. Almost all the respondents (99.5%) reported that they used vegetable oil to prepare their meals.

Table 5.4.1: Consumption of fruits and vegetables

Factor	Total n (%)	Male n (%)	Female n (%)
Days in a week ate fruit			
0-4	1243 (64.7)	422 (66.8)	817 (63.6)
5-7	453 (23.6)	138 (21.8)	313 (24.4)
don't know	226 (11.8)	72 (11.4)	154 (12.0)
Days in a week ate vegetables			
0-4	97 (5.0)	52 (8.2)	44 (3.4)
5-7	1823 (94.8)	580 (91.8)	1238 (96.4)
don't know	2 (0.1)	0 (0)	2 (0.2)
Oil/fat most often used for cooking			
vegetable oil	1908 (99.5)	625 (99.4)	1277 (99.6)
Other	9 (0.5)	4 (0.6)	5 (0.4)

5.5 Physical activity

5.5.1 Vigorous-intensity physical activity at work

Table 5.5.1.1 shows rates of vigorous-intensity activity involved in at work. While 14.1% of females and 29.2% of males were involved in vigorous-intensity activity at

work, 45.7% of females and 32.8% of males were involved in such activities 7 days in a week. Female respondents (68.3%) tended to be involved in such activities for less than 1 hour 30 minutes on a typical day compared to males (31.8%).

Table 5.5.1.1: Vigorous-intensity activity at work.

Factor	Total n (%)	Male n (%)	Female n (%)
Work involved vigorous-intensity activity			
Yes	360 (19.1)	182 (29.2)	177 (14.1)
No	1522 (80.9)	442 (70.8)	1076 (85.9)
Number of days vigorous-intensity activity was done as part of work in a typical week			
1	27 (7.6)	8 (4.4)	19 (10.9)
2	38 (10.7)	17 (9.4)	21 (12.0)
3	34 (9.6)	17 (9.4)	17 (9.7)
4	13 (3.7)	5 (2.8)	7 (4.0)
5	52 (14.6)	38 (21.1)	14 (8.0)
6	53 (14.9)	36 (20.0)	17 (9.7)
7	139 (39.0)	59 (32.8)	80 (45.7)
Time spent on vigorous-intensity activity at work on a typical day (hours)			
<1.5	125 (54.8)	27 (31.8)	97 (68.3)
1.5-3.4	57 (25.0)	27 (31.8)	30 (21.1)
3.5+	46 (20.2)	31 (36.5)	15 (10.6)

5.5.2 Vigorous-intensity recreational activity

More males (29.7%) than females (8.7%) were engaged in vigorous-intensity sport, fitness or recreational activity, with 17.6% of males and 17.1% of females being engaged in such activities 7 days in a week (Table 5.5.2.1). Female respondents (75.9%) tended to spend less time on a typical day (1 hour 30 minutes) on such activities than males (48.0%).

Table 5.5.2.1: Vigorous-intensity recreational activity

Factor	Total n (%)	Male N (%)	Female n (%)
Fitness or recreational sport involved vigorous-intensity activity			
Yes	298 (15.6)	187 (29.7)	111 (8.7)
No	1618 (84.4)	442 (70.3)	1170 (91.3)
Number of days vigorous-intensity sport was done in a typical week			
1	114 (38.9)	62 (34.1)	52 (46.8)
2	58 (19.8)	36 (19.8)	22 (19.8)
3	39 (13.3)	28 (15.4)	11 (9.9)
4	13 (4.4)	13 (7.1)	0 (0)
5	17 (5.8)	11 (6.0)	6 (5.4)
6	1 (0.3)	0 (0)	1 (0.9)
7	51 (17.4)	32 (17.6)	19 (17.1)
Time spent on vigorous-intensity sport on a typical day (hours)			
<1.5	171 (58.8)	86 (48.0)	85 (75.9)
1.5-3.4	109 (37.5)	83 (46.4)	26 (23.2)
3.5+	11 (3.8)	10 (5.6)	1 (0.9)

5.5.3 Moderate-intensity physical activity at work

Significantly more females (75.5%) than males (58.4%) were involved in moderate-intensity activity at work. Overall 71.0% of females and 35.9% of males were involved in such activities 7 days in a week. More males (19.7%) than females (8.6%) tended to spend more hours (3 hours 30 minutes or more) on such activities on a typical day (Table 5.5.3.1).

Table 5.5.3.1: Moderate-intensity physical activity at work

Factor	Total n (%)	Male n (%)	Female n (%)
Work involved moderate-intensity activity			
Yes	1334 (69.8)	365 (58.4)	966 (75.5)
No	576 (30.2)	260 (41.6)	313 (24.4)
Number of days moderate-intensity activity was done as part of work in a week			
1	71 (5.3)	26 (7.2)	45 (4.7)
2	64 (4.8)	23 (6.4)	41 (4.3)
3	62 (4.7)	21 (5.8)	41 (4.3)
4	46 (3.5)	22 (6.1)	24 (2.5)
5	166 (12.5)	93 (25.7)	73 (7.6)
6	103 (7.8)	47 (13.0)	55 (5.7)
7	816 (61.4)	130 (35.9)	684 (71.0)
Time spent on moderate-intensity activity at work on a typical day			
<1.5	614 (57.0)	106 (47.5)	508 (59.7)
1.5-3.4	345 (32.0)	73 (32.7)	270 (31.7)
3.5+	118 (11.0)	44 (19.7)	73 (8.6)

5.5.4 Moderate-intensity recreational activity

About a third of both male (33.4%) and female (30.5%) respondents were in involved in moderate-intensity sport. Overall 40.9% of males and 33.7% of females reported being involved in such activities 7 days in a typical week. Most of the respondents (79.8% of males, and 83.7% of females) spent less than 1 hour 30 minutes on a typical day on such activities (Table 5.5.4.1).

Table 5.5.4.1: Moderate-intensity recreational activity

Factor	Total n (%)	Male n (%)	Female n (%)
Fitness or recreational sport involved moderate-intensity activity			
Yes	598 (31.4)	208 (33.4)	389 (30.5)
No	1306 (68.6)	415 (66.6)	886 (69.5)

Number of days moderate-intensity sport was done in a typical week			
1	83 (13.9)	33 (15.9)	50 (12.9)
2	92 (15.4)	26 (12.5)	66 (17.0)
3	70 (11.7)	18 (8.7)	52 (13.4)
4	35 (5.9)	9 (4.3)	26 (6.7)
5	71 (11.9)	23 (11.1)	48 (12.3)
6	30 (5.0)	14 (6.7)	16 (4.1)
7	217 (36.3)	85 (40.9)	131 (33.7)
Time spent on moderate-intensity sport on a typical day (hours)			
<1.5	481 (82.2)	162 (79.8)	319 (83.7)
1.5-3.4	93 (15.9)	37 (18.2)	55 (14.4)
3.5+	11 (1.9)	4 (2.0)	7 (1.8)

5.5.5 Travel to and from places

Overall, 92.2% of the respondents walked or used a bicycle to get to and from places, with 59.2% of males and 41.3% of females doing so 7 days in a week. More males (23.5%) than females (12.1%) spent walking or cycling for at least an hour on a typical day (Table 5.5.5.1).

Table 5.5.5.1: Walking or cycling to and from places

Factor	Total n (%)	Male N (%)	Female n (%)
Walked or used a bicycle to get to and from places			
Yes	1759 (92.2)	584 (93.0)	1172 (91.9)
No	149 (7.8)	44 (7.0)	103 (8.1)
Number of days walked or cycled in a week to get to and from places			
1	140 (7.9)	30 (5.1)	110 (9.3)
2	172 (9.7)	24 (4.1)	147 (12.5)
3	176 (9.9)	30 (5.1)	145 (12.3)
4	105 (5.9)	22 (3.7)	83 (7.1)
5	200 (11.3)	77 (13.1)	122 (10.4)
6	141 (8.0)	57 (9.7)	84 (7.1)
7	836 (47.2)	348 (59.2)	486 (41.3)

Time spent on walking or cycling for travel on a typical day			
<10 minutes	234 (13.2)	73 (12.4)	161 (13.7)
10-29.9 minutes	706 (39.9)	193 (32.8)	510 (43.3)
30 minutes - 1 hour	548 (30.9)	184 (31.3)	364 (30.9)
more than 1 hour	283 (16.0)	138 (23.5)	143 (12.1)

5.5.6 Sedentary behaviour

About a third of the respondents (35.3% of males, and 32.6% of females) spent at least 3 hours 30 minutes sitting or reclining on a typical day (Table 5.5.6.1)

Table 5.5.6.1: Sedentary behaviour

Factor	Total n (%)	Males n (%)	Females n (%)
Time usually spent sitting or reclining on a typical day (hours)			
<1.5	462 (24.2)	125 (19.8)	337 (26.6)
1.5-3.4	804 (42.2)	283 (44.8)	518 (40.8)
3.5+	640 (33.6)	223 (35.3)	414 (32.6)

Factors associated with sitting or reclining for at least 3 hours 30 minutes on a typical day are presented in Table 5.5.6.2. Age, work involving vigorous-intensity and moderate-intensity activities were significantly associated with sedentary behaviour in bivariate analyses, as well as in the multivariate analysis. Compared to respondents of age 25-34 years, respondents who were of age 45 years or more were 31% (AOR=0.69, 95%CI [0.55, 0.87]) less likely to have sedentary behaviour. Respondents who were not involved in moderate-intensity and vigorous-intensity activities at work were 32 % (AOR=0.68, 95%CI [0.55, 0.84]) and 48% (AOR=0.52, 95%CI [0.39, 0.69]) less likely, respectively, to have sedentary behaviour compared to respondents who were involved in such work-related activities.

Table 5.5.6.2: Factors associated with sedentary behaviour

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
Age (years)		
25-34	1	1
35-44	1.17 (0.91, 1.51)	1.12 (0.86, 1.45)
45+	0.67 (0.53, 0.83)	0.69 (0.55, 0.87)
Sex		
Male	1	-
Female	1.13 (0.92, 1.38)	
Consumed alcohol in past 30 days		
Yes	1	-
No	0.86 (0.54, 1.36)	
Currently smoked cigarettes		
Yes	1	-
No	0.94 (0.64, 1.38)	
Waist-Hip ratio		
≤ 1	1	-
> 1	0.54 (0.22, 1.35)	
Diabetes or impaired glucose tolerance		
Normal	1	-
diabetes or impaired glucose tolerance	1.09 (0.66, 1.78)	
Heart rate	1	-
Normal	1.31 (0.78, 2.18)	
Slow	1.09 (0.59, 2.03)	
Fast		
Work involved vigorous-intensity activity		
Yes	1	1
No	0.56 (0.43, 0.72)	0.52 (0.39, 0.69)
Work involved moderate-intensity activity		
Yes	1	1
No	0.67 (0.55, 0.82)	0.68 (0.55, 0.84)

5.6. Overweight or obese

The rates of overweight and obese are presented in Table 5.6.1. Overall, 25.1% (15.5% among male and 30.0% among female), and 14.2% (5.1% among male and 18.6% among

female) participants were overweight and obese, respectively. Only 1.0% of all the participants had a waist-hip ratio of more than 1.

Table 5.6.1: Overweight or obese

Factor	Total n (%)	Males n (%)	Females n (%)
Body mass index			
<18.5	151 (7.9)	73 (11.6)	78 (6.2)
18.5-24.9	1004 (52.8)	425 (67.8)	574 (45.3)
25.0-29.9	477 (25.1)	97 (15.5)	380 (30.0)
30+	269 (14.2)	32 (5.1)	236 (18.6)
Waist hip ratio			
≤ 1	1823 (99.0)	614 (97.8)	1203 (99.6)
> 1	19 (1.0)	14 (2.2)	5 (0.4)

Factors associated with overweight or obese are presented in Table 5.6.2. Although age, sex, education, eating vegetables, consuming alcohol, smoking cigarettes, and blood pressure were significantly associated with overweight or obese in bivariate analyses, only age, sex, smoking cigarettes, and blood pressure were independently associated with overweight or obese. Participants in the age groups 35-44 years and 45+ years more likely to be overweight or obese (AOR=3.17 (95%CI [1.85, 5.44]) for age group 35-44 years; and AOR=2.37 (95%CI [1.32, 4.26]) for the age group 45+ years) compared to participants who were of age 25-34 years. The female gender was positively associated with being overweight or obese (AOR=3.94, 95%CI [2.45, 6.33]). Non-smokers were 3.62 (95%CI [1.74, 7.54]) times more likely to be overweight or obese compared to smokers. Non-smokers were 3.62 (95%CI [1.74, 7.54]) times more likely to be overweight or obese compared to smokers. Compared to participants who had normal blood pressure, participants who had mild or moderate hypertension were more likely to be overweight or obese (AOR=1.74 (95%CI [1.05, 2.88]) for mild hypertension, and AOR=3.37 (95%CI [1.53, 7.39]) for moderate hypertension). However to significant risk for overweight or obese was associated with severe hypertension (AOR=2.04 (95%CI [0.70, 5.92]).

Table 5.6.2: Factors associated with overweight or obese

Factor	OR (95%CI)	AOR (95%CI)
Age (years)		
25-34	1	1
35-44	1.88 (1.49, 2.39)	3.17 (1.85, 5.44)
45+	2.30 (1.84, 2.88)	2.37 (1.32, 4.26)
Sex		
Male	1	1
Female	3.65 (2.92, 4.56)	3.94 (2.45, 6.33)
Education		
None	1	1
Primary	1.06 (0.78, 1.45)	1.52 (0.71, 3.23)
Secondary	0.74 (0.57, 0.95)	1.77 (0.92, 3.42)
college/university	1.10 (0.85, 1.43)	2.51 (1.26, 5.01)
Number of days ate vegetables in a typical week		
0-4	1	1
5-7	1.86 (1.16, 2.96)	1.47 (0.57, 3.75)
Number of days ate fruits in a typical week		
0-4	1	-
5-7	1.06 (0.85, 1.32)	
Number of hours spent on sitting or reclining on a typical day (Sedentary behaviour)		
<1.5	1	-
1.5-3.4	1.04 (0.82, 1.31)	
3.5+	1.01 (0.79, 1.30)	
Consumed alcohol in past 30 days		
Yes	1	1
No	1.69 (1.07, 2.68)	1.03 (0.60, 1.75)
Currently smoked cigarettes		
Yes	1	1
No	5.29 (3.06, 9.14)	3.62 (1.74, 7.54)
Blood pressure		
Normal	1	1
Mild	1.83 (1.46, 2.30)	1.74 (1.05, 2.88)
Moderate	3.23 (2.20, 4.81)	3.37 (1.53, 7.39)
Severe	3.10 (2.10, 4.57)	2.04 (0.70, 5.92)

5.7 Blood pressure

Only 29.2% of males and 52.4% of females had their blood pressure measured with the previous one year to the survey. Overall, 13.7% of the respondents were told by the health workers in the previous 12 months to the survey that they had raised blood pressure. Altogether, 7.6% of the respondents currently received any advice or treatment for high blood pressure. Moderate or severe blood pressure was estimated at 12.5% (12.05 of males and 13.2% of females) at the time of the survey. The above results are shown in Table 5.7.1.

Table 5.7.1: Raised blood pressure

Factor	Total n (%)	Males n (%)	Females n (%)
Last time blood pressure was measured by health worker (years ago)			
<1	856 (44.7)	185 (29.2)	670 (52.4)
1-5	407 (21.2)	94 (14.8)	311 (24.3)
>5	654 (34.1)	354 (55.9)	297 (23.2)
Told that has raised blood pressure in past 12 months			
Yes	262 (13.7)	64 (10.1)	198 (15.5)
No	1650 (86.3)	567 (89.9)	1077 (84.5)
Currently received drugs for high blood pressure in the past 2 weeks			
Yes	105 (5.5)	20 (3.2)	85 (6.7)
No	1812 (94.5)	613 (96.8)	1193 (93.3)
Currently on special prescribed diet for high blood pressure			
Yes	78 (4.1)	17 (2.7)	61 (4.8)
No	1836 (95.9)	616 (97.3)	1214 (95.2)
Currently received advice or treatment to lose weight to control high blood pressure			
Yes	63 (3.3)	11 (1.7)	52 (4.1)
No	1851 (96.7)	622 (98.3)	1223 (95.9)
Currently received advice or treatment to stop smoking			
Yes	38 (2.0)	11 (1.7)	27 (2.1)
No	1876 (98.0)	621 (98.3)	1249 (97.9)

Currently received advice to start or do more exercise to control high blood pressure			
Yes	79 (4.1)	24 (3.8)	55 (4.3)
No	1836 (95.9)	609 (96.2)	1221 (95.7)
Currently received any of the above advice or treatment for high blood pressure			
Yes	146 (7.6)	34 (5.4)	112 (8.7)
No	1782 (92.4)	600 (94.6)	1176 (91.3)
Blood pressure in the current survey			
Normal	1231 (65.2)	387 (62.0)	840 (66.7)
Mild	422 (22.3)	168 (26.9)	253 (20.1)
Moderate	119 (6.3)	37 (5.9)	82 (6.5)
Severe	117 (6.2)	32 (5.1)	84 (6.7)
Treated with drugs for hypertension in past 2 weeks			
Yes	51 (3.0)	7 (1.3)	44 (3.8)
No	1664 (97.0)	539 (98.7)	1119 (96.2)
Heart rate			
Slow	64 (3.4)	48 (7.6)	16 (1.3)
Normal	1716 (89.8)	555 (88.2)	1153 (90.6)
Fast	130 (6.8)	26 (4.1)	104 (8.2)
Seen a traditional healer for high blood pressure in past 12 month			
Yes	6 (0.3)	3 (0.5)	3 (0.2)
No	1910 (99.7)	630 (99.5)	1274 (99.8)
Currently took any herbal or traditional remedy for high blood pressure			
Yes	16 (0.8)	3 (0.5)	13 (1.0)
No	1900 (99.2)	630 (99.5)	1264 (99.0)

Factors associated with moderate or severe hypertension are presented in Table 5.7.2. Of the factors considered in bivariate analyses to be associated with moderate or severe hypertension, age, education level, sedentary behaviour, body mass index, waist-hip ratio, levels of cholesterol, and fasting blood glucose were significantly associated with raised blood pressure. In multivariate analysis, compared to respondents in the age group 25-34 years, older respondents were more likely to have moderate or severe hypertension (AOR=2.27 (95%CI [1.41, 3.67]) for 35-44 years age group, and AOR=8.66 (95%CI [5.75, 13.04]) for age group 45+ years). Compared to respondents with BMI of <18.5,

those with BMI of 25+ were more likely to have moderate or severe hypertension (AOR=2.63 (95%CI [1.23, 5.63]) for 25.0-29.9 BMI, and AOR=4.16 (95%CI [1.91, 9.06]) for 30+ BMI). Participants with raised cholesterol levels were 63% (95%CI [1.11, 2.40]) more likely to have moderate or severe hypertension compared to participants with normal cholesterol levels.

Table 5.7.2: Factors associated with moderate or severe hypertension

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
Age group (years)		
25-34	1	1
35-44	2.68 (1.72, 4.18)	2.27 (1.41, 3.67)
45+	10.40 (7.21, 15.0)	8.66 (5.75, 13.04)
Sex		
Male	1	-
Female	0.22 (0.91, 1.65)	
Education		
None	1	1
Primary	0.71 (0.46, 1.10)	0.94 (0.57, 1.57)
Secondary	0.58 (0.41, 0.83)	0.98 (0.64, 1.49)
college/university	0.60 (0.41, 0.88)	0.88 (0.56, 1.36)
Time usually spent sitting or reclining on a typical day (hours) (sedentary behaviour)		
<1.5	1	1
1.5-3.4	1.14 (0.78, 1.67)	1.10 (0.72, 1.67)
3.5+	1.70 (1.17, 2.47)	1.26 (0.82, 1.95)
Body Mass Index (BMI)		
<18.5	1	1
18.5-24.9	1.67 (0.79, 3.52)	1.63 (0.76, 3.46)
25.0-29.9	3.20 (1.50, 6.80)	2.63 (1.23, 5.63)
30+	6.56 (3.05, 14.10)	4.16 (1.91, 9.06)
Consumed alcohol in past 30 days		
Yes	1	-
No	1.53 (0.81, 2.89)	
Currently smoked cigarettes		
Yes	1	-
No	1.29 (0.71, 2.32)	

Waist-Hip ratio		
≤ 1	1	1
>1	3.19 (1.20, 8.47)	1.39 (0.40, 4.76)
Cholesterol		
Normal	1	1
Raised	2.46 (1.79, 3.39)	1.63 (1.11, 2.40)
Fasting blood glucose		
Normal	1	1
Hypoglycemia	0.97 (0.69, 1.37)	1.18 (0.78, 1.80)
Impaired glucose tolerance or diabetic	2.41 (1.38, 4.21)	0.71 (0.35, 1.44)
Heart rate		
Normal	1	-
Slow	0.82 (0.40, 1.69)	
Fast	0.90 (0.38, 2.16)	

5.8 Impaired glucose tolerance or diabetes

Altogether, 6.2% of the respondents (5.4% of males and 6.6% of females) reported having had their blood sugar levels measured in the previous 12 months to the survey. About two percent (1.9% of males and 1.8% of females were told by health workers that they had diabetes. Meanwhile, 1.1% of males and 1.8% of females currently received any advice or treatment for diabetes. During the survey, 2.1% of males and 2.9% of females were found with diabetes. These results are presented in Table 5.8.1.

Table 5.8.1: Diabetes.

Factor	Total N (%)	Males n (%)	Females n (%)
Blood sugar measured in past 12 months			
Yes	118 (6.2)	34 (5.4)	84 (6.6)
No	1799 (93.8)	599 (94.6)	1194 (93.4)
Told by health worker that has diabetes			
Yes	35 (1.8)	12 (1.9)	23 (1.8)
No	1881 (98.2)	621 (98.1)	1255 (98.2)
Currently received insulin			
Yes	14 (0.7)	2 (0.3)	12 (0.9)
No	1902 (99.3)	630 (99.7)	1266 (99.1)

Currently received oral drugs for diabetes in last 2 weeks			
Yes	20 (1.0)	7 (1.1)	13 (1.0)
No	1894 (99.0)	625 (98.9)	1263 (99.0)
Currently received special prescribed diet for diabetes			
Yes	23 (1.2)	7 (1.1)	16 (1.3)
No	1891 (98.8)	625 (98.9)	1260 (98.7)
Currently received advice or treatment for diabetes to lose weight			
Yes	19 (1.0)	6 (0.9)	13 (1.0)
No	1896 (99.0)	627 (99.1)	1263 (99.0)
Currently received advice or treatment for diabetes to stop smoking			
Yes	14 (0.7)	4 (0.6)	10 (0.8)
No	1901 (99.3)	629 (99.4)	1266 (99.2)
Currently received advice for diabetes to start or do more exercise			
Yes	16 (0.8)	6 (0.9)	10 (0.8)
No	1899 (99.2)	627 (99.1)	1266 (99.2)
Currently received any of the above advice or treatment for diabetes			
Yes	30 (1.6)	7 (1.1)	23 (1.8)
No	1898 (98.4)	627 (98.9)	1265 (98.2)
Glucose levels in the current survey			
Hypoglycemia	396 (21.1)	119 (19.4)	277 (22.0)
Normal	1409 (74.9)	474 (77.2)	929 (73.7)
Impaired glucose tolerance	24 (1.3)	8 (1.3)	16 (1.3)
Diabetes	51 (2.7)	13 (2.1)	38 (3.0)
Seen a traditional healer for diabetes			
Yes	1 (0.1)	1 (0.2)	0 (0)
No	1912 (99.9)	631 (99.8)	1275 (100)
Currently took any herbal or traditional remedy for diabetes			
Yes	1 (0.1)	1 (0.2)	0 (0)
No	1911 (99.9)	630 (99.2)	1275 (100)

Factors associated with impaired levels of glucose or diabetes are presented in Table 5.8.2. Age, body mass index, waist-hip ratio, hypertension, and cholesterol were significantly associated with impaired glucose tolerance or diabetes in bivariate analyses. In multivariate analysis, compared to participants in the age group 25-34 years, older

participants were more likely to have impaired glucose tolerance or diabetes (AOR=2.49 (95%CI [1.35, 2.92]) for 35-44 years age group, and AOR=3.80 (95%CI [2.00, 7.23]) for 45+ years age group). Only mild hypertension was associated with impaired glucose tolerance or diabetes (AOR=2.57 (95%CI [1.44, 4.57]). No significant associations were observed between moderate or severe hypertension and impaired glucose tolerance or diabetes.

Table 5.8.2: Factors associated with impaired glucose tolerance or diabetes

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
age group (years)		
25-34	1	1
35-44	5.03 (2.25, 11.25)	2.49 (1.26, 4.92)
45+	10.98 (5.33, 22.64)	3.80 (2.00, 7.23)
Sex		
Male	1	-
Female	1.31 (0.78, 2.20)	
Education		
None	1	-
Primary	1.22 (0.60, 2.48)	
Secondary	0.64 (0.33, 1.25)	
College/university	0.92 (0.48, 1.75)	
Body Mass Index (BMI)		
<18.5	1	1
18.5-24.9	0.49 (0.18, 1.35)	0.51 (0.20, 1.35)
25.0-29.9	1.21 (0.45, 3.29)	0.82 (0.30, 2.25)
30+	3.13 (1.18, 8.31)	1.76 (0.64, 4.87)
Time usually spent sitting or reclining on a typical day (hours) (sedentary behaviour)		
<1.5	1	-
1.5-3.4	0.85 (0.47, 1.55)	
3.5+	0.98 (0.54, 1.81)	
Currently consumed alcohol		
Yes	1	-
No	1.54 (0.53, 4.43)	
Waist Hip ratio		
$\leq$ 1	1	*
> 1	9.57 (3.18, 28.83)	

Blood pressure		
Normal	1	1
Mild	4.86 (2.76, 8.54)	2.57 (1.44, 4.57)
Moderate	2.60 (0.96, 7.09)	0.98 (0.34, 2.83)
Severe	6.77 (3.26, 14.02)	1.84 (0.75, 4.49)
Cholesterol		
Normal	1	1
Raised	1.85 (1.08, 3.19)	1.23 (0.67, 2.26)

* not enough data to compute the estimate and its confidence interval

5.9 Cholesterol

Overall, 15.8% (12.8% of males and 17.3% of females) of the respondents had raised cholesterol levels (Table 5.9.1).

Table 5.9.1: Cholesterol

	Total	Males	Females
Factor	n (%)	n (%)	n (%)
Cholesterol level			
Normal	1574 (84.2)	533 (87.2)	1036 (82.7)
Raised	296 (15.8)	78 (12.8)	217 (17.3)

Factors associated with raised cholesterol levels are shown in Table 5.9.2. Age, sex, education level, body mass index, waist hip ratio, and frequency of eating vegetables were associated with raised levels of cholesterol in bivariate analyses. In multivariate analysis, older participants were less likely to have raised cholesterol levels compared to participants in the age group 25-34 years (AOR=0.44 (95%CI [0.31, 0.61]) for 35-44 years age group, and AOR=0.66 (95%CI [0.46, 0.95]) for 45+ years age group. Respondents who had body mass index (BMI) of 25 or more were more likely to have raised cholesterol levels compared to those who had body mass index of less than 18.5 (AOR=3.38 (95%CI [1.68, 6.79] for 25.0-29.9 BMI, and AOR=2.92 (95%CI [1.38, 6.17]) for 30+ BMI).

Table 5.9.2: Factors associated raised cholesterol levels

Factor	Unadjusted OR (95%CI)	Adjusted AOR (95%CI)
age group (years)		
25-34	1	1
35-44	1.56 (1.12, 2.16)	0.44 (0.31, 0.61)
45+	2.39 (1.79, 3.19)	0.66 (0.46, 0.95)
Sex		
Male	1	1
Female	1.43 (1.08, 1.89)	1.10 (0.80, 1.53)
Education		
None	1	1
Primary	0.68 (0.44, 1.05)	0.67 (0.42, 1.08)
Secondary	0.66 (0.47, 0.93)	0.75 (0.52, 1.10)
college/university	0.96 (0.68, 1.34)	1.18 (0.81, 1.72)
Body Mass Index (BMI)		
<18.5	1	1
18.5-24.9	1.66 (0.85, 3.26)	1.34 (0.68, 2.64)
25.0-29.9	4.25 (2.16, 8.36)	3.38 (1.68, 6.79)
30+	4.55 (2.25, 9.17)	2.92 (1.38, 6.17)
Waist Hip ratio		
$\leq$ 1	1	1
> 1	4.18 (1.66, 10.52)	2.73 (0.93, 8.03)
Consumed alcohol in past 30 days		
Yes	1	-
No	1.35 (0.75, 2.43)	
Frequency of having eaten vegetable in a typical week		
<5	1	1
5-7	2.25 (1.03, 4.93)	2.07 (0.79, 5.40)

CHAPTER 6
DISCUSSION

This is the first study to report results from a comprehensive general population-based survey on the prevalence rates for risk factors for non-communicable diseases among persons of age 25 years or more. We found that the rate for current tobacco smoking was 6.8% (17.5% for males and 1.5% for females), current consumption of alcohol was 20.7% (37.9% of males and 12.2% of females), fruit was 23.6%, and vegetable was 94.9% most of the week, and physical activity was 31.4% (33.4% of males and 30.5% of females) for moderate-intensity recreational-related activities, and 15.1% (29.7% of males and 8.7% of females) for vigorous-intensity recreational activities. Overweight or obese was estimated at 39.3% (20.6% of males, and 48.6% of females). The rate for moderate or severe hypertension was 12.5% (11.0% of males and 13.2% of females). The prevalence for impaired glucose level or diabetes was 4.0%, and that for raised cholesterol levels was 15.8%.

6.1 Tobacco use

Our rate for current smoking of 6.8% (17.5% among males and 1.5% among females) is much lower than that reported in Mauritius of 35.9% among males and 5.1% among females of age 20-74 years (Ministry of Health & Quality of Life, 2006). Higher rates among 15-64 year-olds for current smoking of 52.9% overall, and 56% among males and 49.7% among females have been reported in Nauru, Australia (Ministry of Health [Nauru] et al, 2005). In Purworejo district of Java Island in Indonesia, the prevalence of smoking of 53.9% among males is much higher than the rate in the current study but comparable to that of women of 1.7% among females (Ng et al, 2006).

Closer home, compared to our findings, a study conducted in three provinces (Midlands, Mashonaland Central, and Matebeleland South) of Zimbabwe among persons of age 15-74 years showed higher rates of current use of any tobacco of 33.4% among males and 5% among females, with most of the tobacco products used being smoked substances (Ministry of Health and Child Welfare et al, 2005). In Dar es Salaam, Tanzania, the rate

of daily smokers among persons in the age group 25-64 years averaged 23% (range 19.6-24.0%) among males, and 1.3% (range 0.8-5.5%) among females, compared to 13% and 1.2% among males and females in the current study. A study conducted in South Africa 20 years ago among Whites of age 15-64 years in a rural community reported rates of 48.1% and 17.9% for current smoking among males and females, respectively (Steenkamp et al., 1988). Generally the rate for current cigarette smoking in Zambia is lower than in other countries. The differences may partly be due to different age groups of the participants in the surveys. In Zambia the age group that we studied was 25 years or more. The age group in the Zambian study excluded the adolescents who are more likely to smoke but not for a long time before they quit smoking. Among the school going adolescents in Lusaka, Zambia, 43.4% of males and 35.6% of females had ever smoked cigarettes (Muula & Siziya, 2007). Another explanation for lower rates for current smoking in Zambia is that the tobacco control regulations that the Government of the Republic of Zambia has put in place may be working.

All the above findings are consistent in that more males than females were current cigarette smokers. The finding in the current study that respondents with little or no formal education were more likely to be current smokers than the more educated respondents, suggest that tobacco control information may not be reaching our to the less educated people. Channels of getting the information across to the less educated should be investigated.

We also found that overweight or obese people were less likely to be current smokers than lean people. If smoking makes people to lose weight, in a population experiencing an HIV/AIDS pandemic, being lean may be associated with the HIV infection, and because of stigma people would not want to lose weight.

6.2 Alcohol consumption

Alcohol consumption in the past 12 months was reported by 26.3% (43.5% of male and 17.7% of female) respondents in Zambia. These rates are much lower than those reported in Cameroon (Health of Populations in Transition Research Group, 2004) of 85% overall

(89% among males, and 82% among females). An overall alcohol consumption rate of 39.6% in the past 12 months to the survey has been reported in Eritrea (Usman et al., 2006). In Nauru, alcohol consumption in the past 12 months was reported by 46.2% (60.7% of male and 32.1% of female) respondents. We again see that Zambia has lower rates of alcohol consumption, partly because in the Zambian study, adolescents were excluded from participation in the survey.

The finding that females were less likely to consume alcohol than males suggests that societies may be less tolerant to females who consume alcohol. Rarely are women, other than sex workers, in Zambia seen in drinking places consuming alcohol. They may consume alcohol at kitchen parties where males are absent, or they may consume alcohol at home in the absence of the public. It is therefore most likely that most women, who reported consuming alcohol in the past 12 months, may not have consumed it daily. In the current study the daily alcohol consumption in the past 12 months was estimated at 13.9% (19.2% among males, and 7.6% among females), and it compares very well with the rate of 11% reported in Cameroon of drinking alcohol in 5 or more days of the week (Health of Populations in Transition Research Group, 2004).

We have discussed the results of alcohol consumption in the past 12 months because several studies report alcohol consumption over this period. However, it would have been more appropriate to report alcohol consumption in the past 30 days, as a measure of current alcohol consumption rate.

6.3 Diet

In the current study fruits were rarely eaten. Only 23.6% of the respondents ate fruits 5-7 days in a typical week. Most (94.8%) of the respondents reported eating vegetables 5-7 days in a typical week. Vegetables are a part of one of the cheapest meals. Many families are not able to afford the cost of fruits; as a result they may eat seasonal fruits that are grown in their backyards (mangoes or guavas), or can be bought from markets at a cheap price when they are in season. Temperate fruits such as apples and grapes are out of reach for most families. In Eritrea, 15.3% and 49.4% of the respondents ate fruits and

vegetables during most of the usual week, respectively (Usman et al., 2006). It appears fruits and vegetables are not easily available for most of the families in Eritrea. Low cost technology on preservation of seasonal fruits should be introduced to families so that family members could eat fruits all year around.

6.4 Physical activity

Overall, one in five (29.2% males, 14.1% females) of the respondents was engaged in work that involved vigorous-intensity activity. Meanwhile, 15.6% of the respondents (29.7% males, and 8.7% females) were engaged in fitness or recreational sport that involved vigorous-intensity activity. About two thirds of the respondents (58.4% males, and 75.5% females) were engaged in work that involved moderate-intensity activity, while one third of the respondents were engaged in fitness or recreational sport that involved moderate-intensity activity. Over 90% of the respondents were either walked or used a bicycle to get to and from places, and about one third of the respondents spent at least 3.5 hours sitting or reclining on a typical day. The observed sedentary prevalence in the current study was lower than that was observed in Eritrea of 60.6% (Usman et al., 2006) but higher than that found in the Nauru of 17% (Ministry of Health [Nauru] et al., 2005) and in urban Indian population of 59.3% among males and 58.5% among females (Singh et al., 2007).

Factors that were positively associated with sedentary behaviour in the current study were having engaged in work that involved in moderate or vigorous intensity activity. A study among youth in Ontario, Canada reported that sedentary behaviour was significantly associated with physical activity (Leatherdale & Wong, 2008). No significant associations were observed with waist-hip-ratio or with alcohol consumption in our study, contrary to Keenan et al (1992) findings who found significant associations. Differences in the results among different studies may be due to different definitions for sedentary behaviour. Our definition of sedentary behaviour did not exclude those who were engaged in work that involved moderate or vigorous intensity activity.

6.5 Over weight or obese

While a higher proportion of females (48.6%) than males (20.6%) were over weight or obese, more males (2.2%) than females (0.4%) had elevated waist-hip-ratios. Our prevalence rates of over weight or obesity are much lower with gender difference than those reported by Ministry of Health [Nauru] et al (2005) of 82.2% among males, and 82.1% among females that did not find gender difference in the rates. A study in Zimbabwe (Ministry of Health and Child Welfare et al., 2005) reported a higher prevalence of over weight or obesity in females than in males that accords the finding in the present study. While in the same study in Zimbabwe, a different cut off point for elevated waist-hip ratio (central obesity) of 0.85 for females, and 0.95 for males was used, our results with a cut off point of 1 do not agree with the Zimbabwean findings of 9.5% and 23.4% among males and females, respectively. A study done in Eritrea also found a higher prevalence rate of central obesity among females than males (Usman et al., 2006).

We found that older respondents were more likely to be over weight or obese, and that female respondents and none cigarette smokers were associated with being over weight or obese. Other studies elsewhere found age (Singh et al., 2007; Amoah, 2003), and female gender (Amoah, 2007) to be associated with over weight or obesity.

6.6 Blood pressure

We found 12.0% of males and 13.2% of females to have moderate or severe hypertension, and that obese, raised cholesterol, and older age group were associated with moderate or severe hypertension. Our rates are higher than those reported in Nauru of 8.7% among males and 4.85 among females (Ministry of Health [Nauru] et al., 2005) but lower than those reported in Zimbabwe of 41% among females and 26% among males (Mufunda et al., 2000), and 25.5% among females and 21.6% among males in South Africa (Alberts et al., 2005). A rate for hypertension of 16% was reported in Eritrea (Usman et al., 2006; Mufunda et al., 2006).

A study in South Africa found that age was positively correlated with blood pressure, and that among females blood pressure was associated with body mass index and total serum cholesterol (van Rooyen et al., 2000). In Cameroon, Shey Wiysonge et al (2004) reports a significant association between obesity and hypertension. Meanwhile, in Egypt, El-Shafei et al (2002) reported that age, and elevated BMI were significantly associated with an increased risk of essential hypertension.

6.7 Impaired glucose tolerance or diabetes

The prevalence of diabetes was 2.1% among males and 3.0% among females in the present study, and that of impaired glucose tolerance was 1.3% and 1.3% for males and females, respectively. Diabetes or impaired glucose tolerance was associated with older age groups, obesity, elevated waist-hip ratio and severe hypertension. The prevalence rates of diabetes in Nauru of 9.4% among 25-64 years olds (Ministry of Health [Nauru] et al., 2005) and in Northern Sudan of 9.9% among males and 7.5% among females (Elbagir et al., 1998) are much higher than what we found in Lusaka district, Zambia. In South Africa among elderly (age ≥65 years), the prevalence of diabetes was 25.7% among males and 30.3% among females, and that of impaired glucose tolerance was 15% overall (Charlton et al., 1997). Elbagir et al (1996) reported that obesity and age were significantly associated with higher rates of diabetes. In 1998 these authors reported significant associations between age and obesity on one hand and diabetes on the other (Elbagir et al., 1998). Among the Hindu Indian immigrants in Dar es Salaam, the major risk factors for diabetes were age and body mass index (Ramaiya et al., 1991).

6.8 Cholesterol

Overall, 12.8% of male and 17.3% of female respondents had raised cholesterol levels. These rates are much lower than those reported by Gupta et al (2004) in Punjabi Bhatia community of 33.2% among males and 28.9% among females, and lower than the rates reported in Mauritius of 45% among males and 375 among females (Ministry of Health [Mauritius] & Quality of Life, 2004). However, our rates are comparable to the overall rate reported by Reddy et al (2002) of 18.6% in Andhra Pradesh, in another part of India, and to those reported in Nauru of 20.8% among females and 14.9% among males

(Ministry of Health [Nauru] et al., 2005). The higher rates of hypercholesterolemia observed in South Asia may be attributed to region's economic development. Comparing our prevalence rates of hypercholesterolemia to those found in the region, we note that our rate is much lower than the 40% that was reported in older South Africans (Charlton et al., 2001), and much lower than the 47% and 46% reported among males and females, respectively, in a peri-urban working class community in South Africa (Steyn et al., 2004).

Age and over weight or obesity were significantly associated with raised cholesterol levels. Gupta et al (2004) also reported a significant association between body mass index and hypercholesterolemia. Kruger et al (2003) reported that inactive overweight persons had the highest total cholesterol levels. In a study done in Nauru (Ministry of Health [Nauru] et al., 2005), age was found to be significantly associated with raised cholesterol levels.

CHAPTER 7
POSSIBLE LIMITATIONS

Though the study design provides reliable and valid information, the study may have some limitations. The survey was done in Lusaka district, and hence the results can only be generalized to the sampled population. Some information was missing, especially for total cholesterol. Most of the test strips for total cholesterol could not produce results. We did not have reliable information on the number of household members of age 25 years or older in order to enable us to compute response rates. Therefore, we could not compute weights that could have been used in the analysis. Our findings may be biased to the extent that non-respondents differed from those that participated in the survey. However, we are unable to suggest the direction of bias. Some study factors in our survey were obtained through self-reports, and as in all such studies, both inadvertent and deliberate reporting is a concern, more so that we obtained personal identifiers. In spite of the above limitations, we believe that our findings are credible as they compare favourably with those obtained in the Zambia Demographic and Health Survey.

CHAPTER 8
CONCLUSIONS

We conclude that the tobacco smoking epidemic is in its early stage, as well as for diabetes. Hypertension, hypercholesterolemia, alcohol consumption, and overweight or obese are already at alarming levels. Although most people in the study setting consumed vegetables, the amount eaten was below the amount that is recommended by WHO. The frequency and amount of fruit consumption was also below the levels recommended by WHO. Only a small proportion of the respondents were involved in physical activity. The results of this study can be generalized at most to urban populations.

CHAPTER 9
RECOMMENDATIONS

Since a significant proportion of adults who smoke initiated the habit in their adolescence, tobacco control interventions should be mostly targeted to this age group. The implementation of the WHO FCTC should be the guiding principle in tobacco control.

Health education interventions for people to adopt healthier lifestyles should be formulated. This should include diet and physical activity in the programs.

Risk factors for non-communicable diseases may vary between rural and urban settings, and it is thus recommended that a similar study be conducted in a rural setting.

The observed associations between behavioural (tobacco use, alcohol, physical activity and nutrition) and physiological (obesity, blood pressure, high blood glucose and high cholesterol) risk factors on one hand, with non-communicable diseases on the other should be considered in the design of interventions to control these diseases.

CHAPTER 10
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CHAPTER 11
APPENDICES

11.1 Participants' Information Sheet

11.2 Consent Form

11.3 Questionnaire